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CHROMOSOME NUMBERS FOR SOME NORTH AMERICAN *CRYPTANTHA* (BORAGINACEAE)

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ABSTRACT

Gametic chromosome numbers are presented for eleven taxa of North American *Cryptantha*. A haploid number of $n=9$ (*C. pusilla*) is reported for the first time in the subgenus *Krynitzkia*. The common chromosome number of $n=12$ was found for *C. bakeri*, *C. barbigera*, *C. flava*, *C. fulvocanescens*, *C. oblata*, *C. paysonii*, *C. pustulosa*, and three variations of *C. cinerea*. Eight of these counts are new, three support previous counts, and two indicate possible intraspecific polyploidy.

KEY WORDS: *Cryptantha*, Boraginaceae, chromosome number

The chromosome numbers reported in this paper result from an investigation into the potential benefits of cytological research on the large and complex genus *Cryptantha* in North America. The plants sampled in this study represent nine perennial taxa in the subgenus *Oreocarya* and two annual species in the subgenus *Krynitzkia*. The chromosome numbers obtained in this sample show almost no variation from a common haploid number of $n=12$. The exception is the $n=9$ number obtained for *C. pusilla*. The numbers obtained for *C. barbigera* and *C. oblata* do not agree with previous counts and are either the result of intraspecific polyploidy or the inherent difficulty of obtaining accurate counts for this genus.

In this study, floral buds were fixed in alcohol-acetic acid (3:1) solution, stained in Snow's (1963) hydrochloric acid-carmine stain, squashed by standard technique and observed with phase contrast optics. *Cryptantha* chromosomes are exceedingly difficult to observe because they are small (<10 microns)

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and have a tendency to stick together during most stages of meiosis. The chromosome numbers reported here are from meiocytes in diakinesis, which I found to be the only stage to produce reliable counts. All specimen vouchers are deposited at UNM and the collection numbers cited are mine. Synonymy is provided for the *C. cinerea* variants since the synonyms provide more diagnostic descriptions of the plants sampled than the current taxonomic treatment.

RESULTS

CRYPTANTHA SUBGENUS *OREOCARYA*

Cryptantha bakeri (E. Greene) Payson. n=12. NM, San Juan Co., 5 km W of La Plata on Hwy 173, 17 May 1983, *1080*. This is the same count reported by Higgins (1971).

Cryptantha cinerea (E. Greene) Cronq. var. *abortiva* (E. Greene) Cronq. [= *C. jamesii* (Torr.) Payson var. *disticha* (Eastw.) Payson]. n=12. NM, Taos Co., 8 km N of Rinconada, 2 June 1984, *1239*.

Cryptantha cinerea (E. Greene) Cronq. var. *abortiva* (E. Greene) Cronq. [= *C. jamesii* (Torr.) Payson var. *setosa* (Jones) Johnst. *ex* Tidestr.]. n=12. NM, Socorro Co., Chupadera Mesa, 16 km ENE of Bingham, 7 May 1983, *1058*.

Cryptantha cinerea (E. Greene) Cronq. var. *jamesii* Cronq. [= *C. jamesii* (Torr.) Payson var. *multicaulis* (Torr.) Payson]. n=12. NM, San Juan Co., 5 km SSW of Bloomfield and 1 km W of Hwy 44, 17 May 1983, *1073*.

Cryptantha flava (A. Nels.) Payson. n=12. NM, Sandoval Co., 2 km SE of Bernalillo on I-25, 31 March 1984, *1154*. This is the same count reported by Higgins (1971).

Cryptantha fulvocanescens (S. Wats.) Payson. n=12. NM, Sandoval Co., 3 km NE of Algodones on I-25, 12 April 1984, *1157*; San Juan Co., 4 km S of Farmington on Hwy 371, 15 May 1984, *1199*; Rio Arriba Co., 3 km NW of Abiquiu and 0.5 km N of the Chama River, 20 May 1984, *1228*. This is the same count reported by Higgins (1971).

Cryptantha oblata (Jones) Payson. n=12. NM, Doña Ana Co., Tortugas Mt., 5.5 km E of Las Cruces, 18 March 1983, *994*. Another plant from this same location was determined to be n=6 (at telophase I) by Ward (1983), however, the specimen was misidentified and published as *C. jamesii* var. *multicaulis*. This chromosome number is anomalous for perennial *Cryptantha* and may be a misinterpretation of the meiotic stage. If Ward's count is accurate, my count of n=12 would indicate intrapopulational polyploidy. This population should receive additional study.

Cryptantha paysonii (Macbr.) Johnst. n=12. NM, Socorro Co., 12 km ENE of Socorro and 2 km E of Cerros de Amado, 7 May 1983, *1052*.

Cryptantha pustulosa (Rydb.) Payson. n=12. NM, Sandoval Co., White Mesa, 7 km W of San Ysidro, 5 May 1984, *1182*.

CRYPTANTHA, SUBGENUS *KRYNITZKIA*

Cryptantha barbigera (A. Gray) E. Greene. n=12. NM, Luna Co., 8 km SE of Deming on the NE slope of the Florida Mts., 17 March 1983, *985*. A previous metaphase count of n=6 has been reported for this species by Ward (1983). These different counts indicate intraspecific polyploidy which should be verified with additional counts from meiocytes in diakinesis.

Cryptantha pusilla (A. Gray) E. Greene. n=9. NM, Luna Co., 29 km SSE of Deming on the S slope of the Florida Mts., 18 March 1983, *992*; Sierra Co., 4 km NE of Caballo Dam on the W slope of the Caballo Mts., 23 April 1983, *1033*. Meiosis appears normal and the pollen of both collections is 100% viable, as determined by cotton-blue staining.

DISCUSSION

The results of this and other studies (Higgins 1971; Mathew & Raven 1962; Ward 1983) show n=12 to be a common haploid number for the North American members of the genus *Cryptantha*. Mathew & Raven (1962) discovered additional ploidy levels while separating *C. similis* Mathew & Raven (n=6) from *C. circumscissa* (Hook. & Arn.) Johnst. (n=12, 18). They interpreted these numbers to be diploid, tetraploid, and hexaploid respectively, and assigned a basic chromosome number of x=6 to the genus.

The haploid number of n=9 reported here for the annual *Cryptantha pusilla* is the first report of this chromosome number for the subgenus *Krynitzkia*. A similar haploid number of n=9 has been reported by Taylor & Brockman (1966) for the perennial *C. celosioides* (Eastw.) Payson (reported as *C. macounii* Eastw.) in the subgenus *Oreocarya*. These are significant departures from Mathew & Raven's basic number of x=6. At 2n=18 they could be triploids, but this explanation seems unlikely since natural triploids are rare and usually infertile in sexually reproducing plants (Grant 1981). Triploids can be highly fertile when apomictic. However, I can find no reference of agamospermy in the Boraginaceae. Agamospermous plants also usually have a perennial habit (Grant 1981), which is not the case with *C. pusilla*. Additional evidence against triploidy is the fact that meiosis appears normal (9 bivalents) in both of the above cases.

It is also possible that the chromosome number of n=9 for *Cryptantha* is aneuploid rather than triploid in origin. Numerical deviations in *Cryptantha* have been reported for the Chilean species of this amphitropical genus. These annual, South American species have diploid numbers of $2n$=14, 20, 62, 64, and 124 (Grau 1983), which defy an attempt to assign a basic chromosome number to the group. The problem with the aneuploidy hypothesis is there are no known intermediate aneuploids between n=6, 9, 12, and 18 in the North American *Cryptantha*. It seems unusual that the two species exhibiting ploidy deviations belong to different subgenera, but both incur a primary repatterning (dysploidy) or polyploid drop (aneuploidy) involving three chromosomes.

There are other genera in the Eritrichieae tribe of the Boraginaceae that also have species with haploid numbers of n=6, 9, and 12 (Britton 1951). Britton's small sample of *Myosotis* resulted in basic chromosome numbers of x=9 and 12 for that genus. He speculates that "These might be further reduced to a common basic number of 3, although no species with that number is known either in the genus or the family." Such an extremely low chromosome number is also not known from any related plant families and could not be considered basic. Hopefully, additional investigators with the necessary optics and patience will continue to study this unusual series of chromosome numbers in the North American *Cryptantha*.

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